Response to Indiana Teacher Review – Bridges in Mathematics Grades 3-4

by Allyn Fisher, Director of Curriculum Development, The Math Learning Center

We find the Indiana reviews for Bridges grades 3 and 4 troubling for two primary reasons. First, no detail at all is provided to justify the cryptic summary judgments. Second, we strongly disagree with the reviewers' conclusions. Below are the four summary ratings followed by a narrative that explains our position.

Overall Rating: Weak (1-2) Summary/Justification/Evidence: Did not have higher thinking. Lack of rigor. Better suited as an intervention piece. Common core standards were only addressed in the supplemental packet, not the actual textbook. There were places that reviewed basic skills found in the common core.

Important Mathematical Ideas: Weak (1-2) Summary/Justification/Evidence: There were few places in the book that addressed the common core standards.

Skills and Procedures: Weak (1-2) Summary/Justification/Evidence: Some skills practiced, but not with depth or rigor.

Mathematical Relationships: Weak (1-2) More of a philosophy than a …..

Overview

Bridges in Mathematics was originally written, with partial funding from the National Science Foundation, to meet the NCTM Standards. Subsequently, supplemental activities and grade level practice books were written to bring Bridges into closer alignment with the NCTM Focal Points and Common Core State Standards.

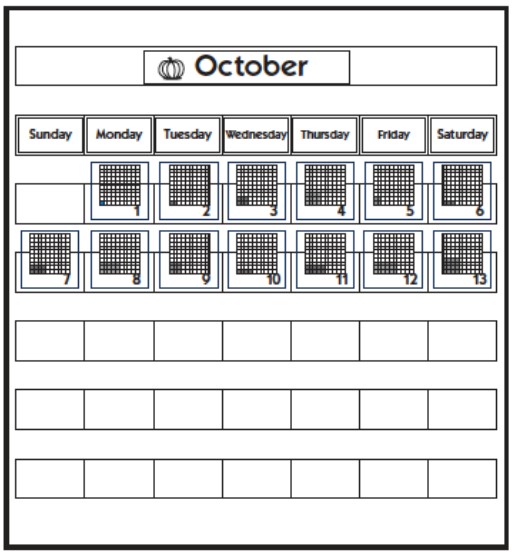
The supplemental activities for each grade level have been carefully integrated into the existing program through the planner found near the beginning of each supplement set. These planners show that activities that don't address Common Core expectations have been stripped out and replaced by activities that do. As we develop new material, it will be added to the grade level supplements and integrated by updating the planners.

Grade 3

The reviewers' assertion that the Common Core Standards are only addressed in the CCSS Supplements is simply not true. In the third grade program, for example, Unit 4 (Multiplication and Division Patterns and Concepts), is a robust introduction to multiplication that opens with a consideration of things that come in groups of various sizes, moves into an in-depth look at the area model and the multiplication table, asks students to both solve and pose multiplication and division story problems, and concludes with an investigation of factors and common multiples. We find strong correlation

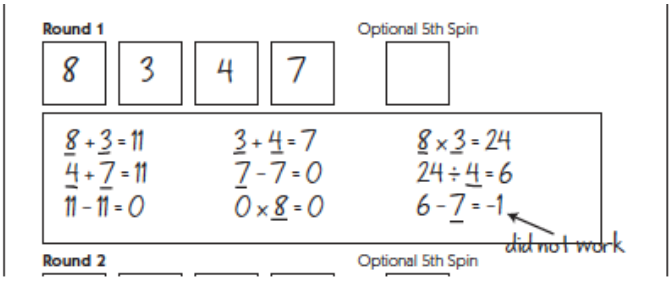
between the instruction in this unit and the nine Common Core standards associated with Operations and Algebraic Thinking in Grade 3 (3.OA.1–3.OA.9).

In addition to the work in this unit, multiplication is addressed throughout the year in the Number Corner, a calendar-based piece designed to deliver a steady stream of key skills instruction in 15–20 minute periods each day, conducted separately from the hour-long Bridges sessions. The area model for multiplication, which figures prominently in the Common Core Standards for Grade 3, is introduced in October via a series of calendar markers. Students describe what they observe each day on the new marker added to the collection, searching throughout the month for patterns that will enable them to accurately predict what they'll see on the next marker.



Marker	Color	Height x Length	Area	Square?
1	blue	1 x 1	1	yes
2	green	1 x 2	2	
3	green	2 x 3	6	
4	purple	3 x 4	12	
5	blue	2 x 2	4	yes
6	green	1 x 3	3	
7	green	2 x 4	8	
8	purple	3 x 5	15	
9	blue	3 x 3	9	yes
10	green	1 x 4	4	
11	green	2 x 5	10	
12	purple	3 x 6	18	
13	blue	4 x 4	16	yes

This activity unfolds over the period of an entire month. It is part of the core program, and directly addresses an entire cluster of Common Core standards in which third graders are asked to investigate the relationship between multiplication and area (3.MD.7). It is both rigorous and engaging, and provides a powerful introduction to multiplication *before* the topic is taught in the context of a unit.



Once Unit 4 has been taught, the daily Number Corner workouts continue to support students in becoming fluent with multiplication facts, introducing a new game or activity each month. The final game, introduced in the May Number Corner is called Make Zero. In this game students spin 4 single-digit numbers at random. Then they add, subtract, multiply, and/or divide to get to zero. If they cannot get to zero with the 4 numbers, they may spin for a fifth number. We believe this to be a clear example of a mathematically rigorous and worthwhile task for third graders.

While there is a great deal of work with multiplication and division in the core program, we have added three Supplement Sets to strengthen what we offer third graders. The first, Supplement Set A1, Equal Expressions, provides students with opportunities to determine an unknown whole number in a multiplication or division equation relating three whole numbers (CCSS 3.OA.4). The second, Supplement Set A2, Basic Multiplication & Division, offers work with facts through 12 x 12, word problems, and models such as repeated jumps on the number line, which didn't figure prominently in the core program. The third Supplement Set A7, Multiplication Beyond the Basics, augments the work students do with 1-digit by 2-digit multiplication in Unit 7, Sessions 12–17.

The sessions in the core program, in conjunction with the CCSS Supplement Set, address the Common Core Standards very explicitly in using an area model along with the distributive property to solve larger multiplication problems. It should be mentioned that the three Supplement Sets amount to 4 lessons and 12 Independent Worksheets. To say that the bulk of multiplication and division instruction in third grade depends on the Supplemental activities is not accurate.

Grade 4

Turning to fourth grade, the emphasis on multiplication continues. Here, the Common Core Standards require students to:

> "Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models." (CCSS 4.NBT.5)

While there is a careful development of multi-digit multiplication using the area model in Bridges, Grade 4, Unit 2, it is a long journey to move from additive to multiplicative thinking; one that takes more than a few weeks or even a few months. It is also imperative that students understand the processes well enough to be able to make good estimates and do complex computations mentally.

For these reasons, we wrote what amounts to a whole new unit on multi-digit multiplication in Supplement Set A5. This 14-session set, which includes its own pre- and post-assessment, takes up where Unit 2 leaves off, and requires students to engage in the process of estimation and critical thinking, as they consider which of the various strategies they have generated and learned is most applicable in any given situation. Once you learn the standard algorithm for multi-digit multiplication, for instance, are you going to use it to figure out what your customer owes when the computer goes down? If your customer has ordered 13 pizzas priced at $12.57 each, perhaps it's time to take out your paper and pencil. If your customer has ordered 5 sodas at $1.99 each, we hope you can figure it in your head. From our standpoint, a rigorous mathematics program offers students a variety of tools, and empowers them to put those tools to good use.